Nest Biology of the Eucerine Bee *Thygater analis* (Hymenoptera, Anthophoridae)

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Received for Publication December 20, 1973

Abstract: Details of the nest of *Thygater analis* are described and diagramed. Information on cell provisions, larval feeding activity, defecation and cocoons is also given.

I had an opportunity to excavate a nest of an unidentified bee at Antonina, Paraná, Brazil on November 7, 1971. Because of the fine texture and cohesive nature of the soil, the excavation was made with considerable accuracy and a rather clear understanding of the nest structure resulted. No adult female was associated with the nest but I was able to determine that the bee belonged to the Eucerini because of larval anatomy, cocoon structure and fecal pattern. Emergence of a female and a male from cocoons on November 7 and 12, 1972 respectively permitted Padre J. S. Moure of the Universidade Federal do Paraná to identify the species as *Thygater analis* (Lepeletier). Although a number of workers have described various aspects of the biology of this species (for references see Urban, 1967) none has described the nest in detail. For that reason and because of the unusual structure of the nest, I offer the following diagram and account to which I have added other information on nesting biology.

Description of Nesting Site. The nest was located on a moderately sloping barren stretch of ground (fig. 1) next to the roadway leading to Antonina, Paraná, Brazil. Only a single nest was located although a search was made for others. The nest entrance was unshaded by the tropical vegetation which surrounded the area. The soil was extremely fine, with almost no rock inclusions, and moist except on the surface.

Description of Nest. The nest entrance was located in a depression, presumably caused by a rock having been removed. The main burrow (fig. 2) entered the ground nearly horizontally in the side of the depression. The tumulus, which was abundant and moderately coarse, filled the lower part of the depression and partly obscured the nest itself. Circular in cross section and with a diameter of

Acknowledgments: I would like to thank Padre Moure and his staff, both for the species identification and for their hospitality and courtesies while I was in Brazil. The research was supported by National Science Foundation Grant GB32193. Specimens of cells, cocoons, larvae, as well as reared adults are in the collection of The American Museum of Natural History.

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Fig. 1. Site of nest of *Thygater analis* near Antonina, Paraná, Brazil. Padre Moure is standing by the nest.

7.0 mm, the main burrow descended for the first several centimeters horizontally but then turned downward and descended vertically. The wall of the main burrow was extremely smooth and when examined under the microscope, faint markings, obviously created by the pygidial plate of the female, could be observed on all sides. Descending open and vertically to about the depth of 20 cm, the burrow then turned horizontally, rose somewhat, descended again, and ended blindly. A single branch, 3.5 cm long and filled with soil, entered the burrow near where it first started to curve horizontally. Connected to the branch was a single, nearly vertical cell (fig. 2, cell 13) containing a small feeding larva and provisions. Attached at the lower end of the cell was a tunnel that descended more or less vertically and then curved horizontally, rose over a distance of about 6 cm before bending downward, at which point it was lost. Three branches, again all filled and about 3.5 cm long, connected to this tunnel and each ended in a single nearly vertical cell. This tunnel was open except near where it attached to the cell 13. Cell 12, farther along in the series, contained a moderately small feeding larva, the next one (cell 11) held a somewhat larger one, and cell 10, closest to cell 13, contained the largest larva. Descending obliquely from the lower end of cell 10 was another more or less horizontal tunnel, filled near the cell with coarse soil but open for the rest of the way. This tunnel led to five filled branches and cells, very much as described for the above tier. Cell

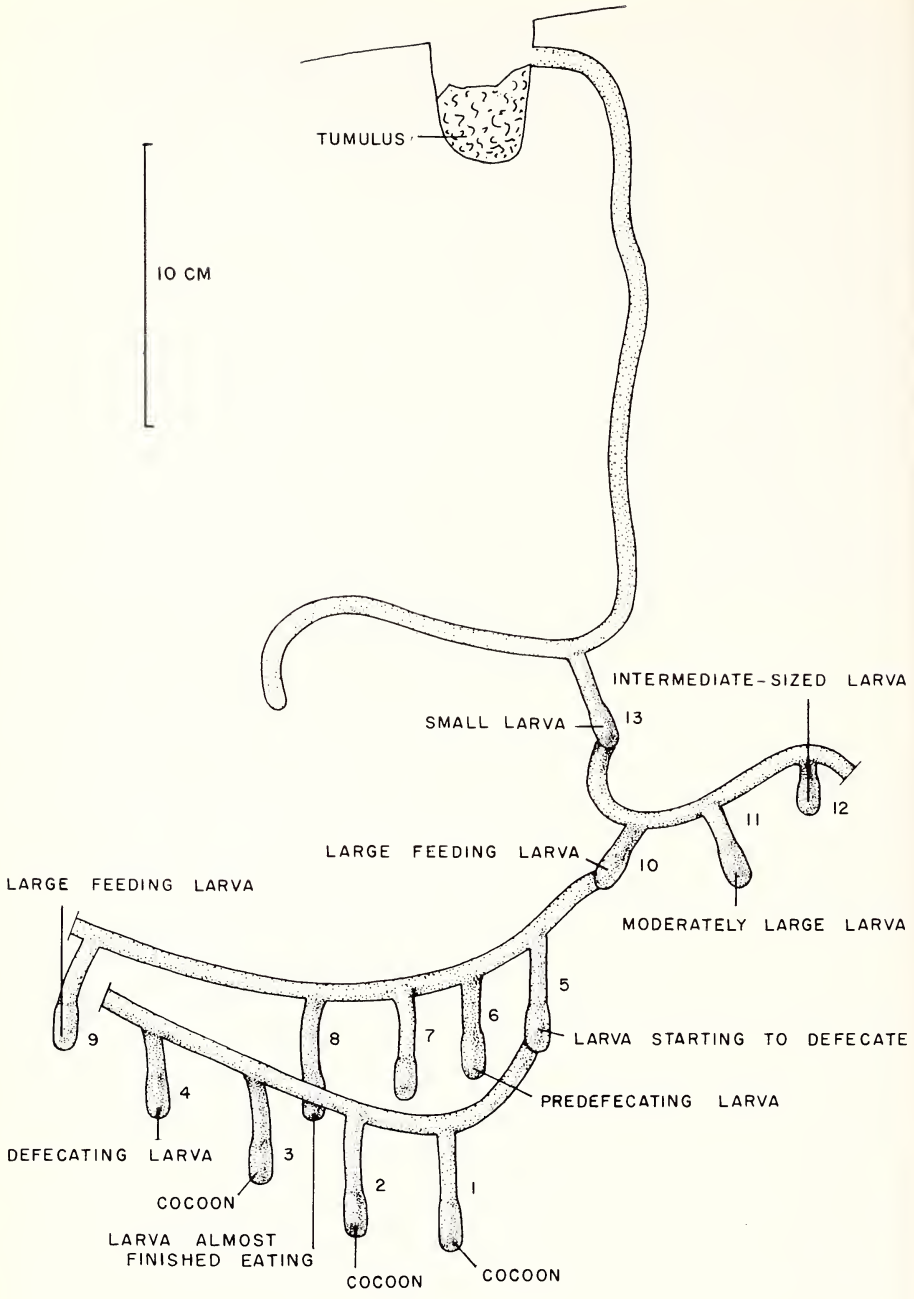

FIG. 2. Diagram of the nest of *Thygater analis*.

9, farthest along, contained a large feeding larva which, however, was the youngest in this series. Cell 5 at the other end held a larva that had finished feeding and was starting to defecate. Connected to this cell was yet another lower, more or less horizontal tunnel filled at the beginning but open elsewhere. This lowest tunnel gave rise to four cells with their filled branches, the one (cell 4) farthest from this connection holding the youngest larva, a form that was defecating but not yet cocoon spinning. The other three cells housed larvae that were either spinning or had spun their cocoons. This account seems to amplify the general description of the nest provided by Michener and Lang (1958).

On the assumption that a cell is constructed, provisioned, oviposited in and closed before the next cell is started, the order of cell construction and provisioning was from cell 1 to cell 13 because of the ages of the larvae. There is no evidence to determine whether the entire tunnel system was constructed before the first branch and the cell were excavated or whether the female dug a vertical tunnel and a lateral to form the tunnel of the lowest tier and then constructed, provisioned and oviposited in the first four cells all before excavating a lateral to form the tunnel of the next higher tier. In each tier the cell closest to the connection to the tier above was constructed and provisioned first; furthermore, the cell in the tier above that received the tier below also contained the oldest individual of the tier.

All tunnels and branches were approximately 7.0 mm in diameter; the fill in branches was loose, coarse soil.

The cells, similar to those of *Svastra obliqua* (Say) (Rozen, 1964), were elongate, 17–18 mm long and had a maximum diameter of 8 mm but little wider than the tunnel. Vertical or nearly so, they possessed an extremely smooth, shiny wall and there was no obvious indication of a built-in lining. The wall was faintly embossed, presumably with the pygidial plate of the female, and was coated with a special semitransparent lining which was obviously waterproof as evidenced by the nature of the provisions. The closures were a somewhat concave spiral on the inside with four to five rows to the radius. The deepest cell was about 44 cm from the surface, the highest, approximately 24 cm.

Provisioning. The source of the pollen was not known. Provisions occupied the lower part of the cell, gave off a faintly aromatic odor, and were approximately 7 mm in depth, at least in one instance. They were apparently stratified into an upper clear layer containing almost no pollen and having a slightly sweet taste, and a lower more opaque yellowish layer, only slightly less liquid and containing pollen.

Development. Young larvae rested on their side while feeding in the soupy provisions. Feeding actively, they curled so that their dorsum often adhered to the cell while they submerged their head and anterior part of their body into

the food. The orientation of older larvae was not ascertained except in one instance in which the larva was found curled around a small quantity of the semiliquid food. Upon finishing feeding, a larva defecates and applies the feces to the area of the cell cap, as was described for *Svastra obliqua* (Rozen, 1964). After the feces are attached to the cell cap, the larva begins to spin its cocoon.

The fecal material and the cocoon are similar to those of *Svastra obliqua* (Rozen, 1964, fig. 2). As in *Svastra* three layers of the cocoon can be detected, the outermost being actually the cell lining that adheres to the cocoon itself. The apparent middle layer is thin, brownish, semitransparent and nonfibrous. The inner layer, closely applied to the middle one, is thin, greyish brown, semiopaque, fibrous and moderately thin. Also as in *Svastra* the top of the cocoon is domed by a moderately thick roof and there are a number of silken partitions separating air spaces between the roof and the feces.

The fact that adults emerged a year after they were collected as larvae seems to indicate that there is a single generation a year.

Parasitism. No parasitic bees were found in the vicinity of this nest and larvae of none were recovered from cells.

Literature Cited

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